



MFG Assessment Application: Assessment Criteria and Metrics

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- **Performance assessment criteria and metrics may be used as the basis for determining the risk rating for a supplier's Production Planning and Controls (PPC) System (strategic, tactical and operational levels), Work Measurement System, Continuous Improvement System, and Producibility System. The Technical Specialist may use either CMO derived performance criteria and metrics or the recommended Criteria and metrics that follow.**
- **The performance assessment criteria presented in the following slides include supporting detail questions. The answers to the detail questions provide the basis for determining the degree to which the performance assessment criteria have been satisfied. Detail questions are not equally weighted, thus the Technical Specialist should consider the relative weighting of each detail question when using the answers to these questions to determine the degree to which the performance assessment criteria have been satisfied. Once the detail questions are answered, a risk rating is assigned with respect to the performance assessment criteria under consideration, using the following risk rating guidance:**
 - **Low Risk - Supplier is fully performing this activity and has achieved goals associated with it.**
 - **Moderate Risk - Supplier has most tools and processes in place, but not fully utilizing the process and/or getting the desired results.**
 - **High Risk - People, processes and tools are not at the minimum prescribed level, resulting in little to no benefit.**
- **Each function assessed will have one or more performance criteria that require assessment, in order to arrive at a risk level for the function under consideration. As is the case regarding detail questions, performance assessment criteria (when multiple performance criteria are present) are not equally weighted, thus the Technical Specialist should consider the relative weighting of each of the performance assessment criteria when using these criteria to determine the degree of risk associated with a specific function.**





MFG Assessment Application: Assessment Criteria and Metrics (Continued)

DEFENSE CONTRACT MANAGEMENT AGENCY

- **Metrics are also used to assess supplier risk. The metrics presented in the following slides are not mandatory, they are provided for consideration in the development of CMO specific risk monitoring activities. These metrics should be tailored for CMO use. The frequency of collecting and analyzing supplier performance metrics shall be based on the risk associated with the supplier's system/process. To the maximum extent practicable, CMOs shall make use of reliable supplier data. When supplier data is utilized, Technical Specialists shall periodically validate the data to ensure its reliability. Not only should metrics be monitored to assess current performance, but also to establish a baseline and mechanism for continuously measuring performance and affecting improvements. Although the achievement of performance targets are desirable, of equal importance are supplier performance trends, with the objective of continuous improvement.**



- ***Demand Management Performance Criterion (DMPC) 1*** - There is a process for forecasting all anticipated demands with sufficient detail and an adequate planning horizon to support sales and operations planning and master scheduling. Forecast accuracy is measured and appropriate action taken in order to continuously improve accuracy and the forecast process.
 - ***Detail Questions Supporting DMPC 1*** - Does the demand forecast consider inputs from sales, marketing, product development, and business development?
 - Does the demand forecast consider external factors that impact demand, including economic factors, industry indicators and competition?
 - Does the demand forecast consider time phased forecasts and schedules communicated by customers?
 - Are spare parts and lower level demands considered in forecasts?
 - Are statistical forecasting tools utilized when and where applicable (this is especially important regarding spares)?
 - Are all significant assumptions underlying the forecast documented?
 - Are assumptions reviewed periodically and updated as market conditions change?

Management Assessment Criteria and Metrics (Continued)

- ***Demand Management Performance Criterion 2*** - Customer order entry and promising are integrated with master scheduling and inventory management. There are mechanisms for matching incoming orders to forecasts, handling abnormal demands, and making sound delivery commitments based on a valid master schedule as well as accurate inventory data.
 - ***Detail Questions Supporting DMPC 1*** - The order promising function has access to appropriate and timely information. Such as Available-to-Promise (ATP), to ensure that good promises are made.
 - Is there a process in place for identifying and managing abnormal demand?
 - Once identified, is abnormal demand handled according to a written policy and procedure?
 - Is abnormal demand (both active and history) identified as such in the company's database?
 - Are customer orders are processed on a timely basis?
 - Are the number of customer orders awaiting processing measured and managed?
 - Is simulation used to support customer order entry and promising in determining the effects of making un-planned customer promises?
 - Are order entry errors measured and managed to eliminate the causes of the errors?
- ***Demand Management Metrics***
 - Demand Forecast Accuracy
 - Order Entry Timeliness
 - Order Entry Error Rate





PPC System (Strategic): Resource Requirements Planning

Assessment Criteria and Metrics

DEFENSE CONTRACT MANAGEMENT AGENCY

- ***Resource Requirements Planning Performance Criteria (RRPPC)*** - There is a process for ensuring sufficient resources requirements (personnel, facilities, equipment, and tooling) for execution of the strategic production plan (from the business plan or the sales and operations plan). Strategic resource requirements are measured and adjusted to ensure execution of forecasted production.
 - ***Detail Questions Supporting RRPPC*** - Are monthly or quarterly (per period) production plan requirements translated into measures of capacity such as labor hours, machine hours, etc.?
 - Are per period resource requirements evaluated against available resources, and shortfalls identified? When shortfalls are identified, are the time phased acquisition of capacity and personnel planned and measured?
 - Is the accountability for maintaining the accuracy of production oriented planning data, such as planned capacity, number of workers, number of machines, and number of shifts, is assigned, understood, and accepted?
 - Are other constraints such as engineering and sub-tier supplier capacity considered in the capacity management process?
 - When planning capacity does the supplier consider:
 - Product life (the decision on types and amounts of capacity are dependent on the expected production lifecycle)?
 - Supply chain (a make or buy decision must be made before considering supplier resource requirements)?
 - Effective availability (the projected time equipment is available based on the number of shifts, projected downtime, and projected non-productive time)?



PPC System (Strategic): Resource Requirements Planning Assessment Criteria and Metrics (Continued)

- ***Detail Questions Supporting RRPPC*** - When planning capacity does the supplier consider (continued):
 - Bottleneck and congestion effects (Improving the efficiency of bottleneck resources can have a much larger effect on TH than increases at non-bottleneck resources and reducing the variability of non-bottleneck and bottleneck resources can result in significant TH improvements)?
 - Projected performance improvements?
 - Lead-time of required resources?
- **When planning workforce requirements, does the supplier consider:**
 - Worker availability (less vacation, sick days, training, etc.)?
 - Number of shifts?
 - Workforce stability, ability to recruit and retain workers?
 - Required skill mix and training (cost and schedule)?
 - Supply chain, a make or buy decision must be made before considering supplier resource requirements?
- **Resource Requirements Planning Metrics**
 - Performance to Workforce Plan
 - Ratio of Actual Labor Base to FPRA Labor Base
 - Performance to Capacity Plan
 - Ratio of Actual Capacity to Planned Capacity

- ***Aggregate Planning Performance Criteria*** - There is a periodic process (quarterly or bi-annually) for planning the aggregate production for which manufacturing management is held responsible. The aggregate planning process is action oriented, where management aggressively resolves problems to maintain balance between market demands and available resources. In addition to considering the demand forecast, other factors such as backlogs, inventory levels, overtime, and workforce stability are considered when planning the aggregate production level for the next year or more.
 - ***Detail Questions Supporting Aggregate Planning Performance Criteria*** - Are monthly or quarterly (per period) production plan requirements translated into measures of capacity such as labor hours, machine hours, etc.?
 - For each product family, are plans reviewed in units of measure that communicate to all functions most effectively?
 - In addition to major programs, are new product development and spares considered in the aggregate planning process?
 - Are sub-tier supplier limitations considered during the aggregate planning process?
 - Is there a mechanism in place to ensure that the aggregate plan agrees with detailed operations plans (master schedule)?
 - Is some form of capacity planning used to validate the reasonableness of the aggregate plan?
 - Is the aggregate plan communicated to the master scheduling function periodically?

- ***Detail Questions Supporting Aggregate Planning Performance Criteria - As a best practice: Is there a production planning team composed of managers from manufacturing, marketing, purchasing and finance? And Are inventory and backlog strategies reviewed each month as part of the strategy?***
- **Are the following questions answered when aggregate planning:**
 - **Should inventories be used to absorb changes in demand during the planning period (e.g. producing more than demand in low demand periods, and using the excess inventory to meet demand in high demand periods)?**
 - **Should changes be accommodated by varying the size of the work force (e.g. hiring for periods of high demand and laying off for periods of low demand)?**
 - **Should overtime absorb fluctuations?**
 - **Should back orders be allowed in order to meet demand (delaying customer orders and satisfying them in a later time period)?**
 - **Should sub-tier suppliers be used on fluctuating orders so that a stable work force can be maintained (acquiring temporary capacity by subcontracting work to others)?**
- **Aggregate Planning Metrics**
 - **Performance to Production Plan**

- ***Master Production Scheduling Performance Criteria (MPSPC) 1*** - The master scheduling process is perpetually managed in order to ensure a balance of stability and responsiveness. The master schedule is reconciled periodically with the production plan resulting from the sales and operations planning process.
 - ***Detail Questions Supporting MPSPC 1*** - Does the master scheduler participate in and provide important detail information to the aggregate planning process?
 - Does the master schedule take into account all demands, including forecasts, contracts, customer orders, specials, prototypes spares, etc? Does the master schedule also take vendor, capacity, and material limitations into account?
 - Is a written master schedule policy followed to monitor stability and responsiveness; are goals established and is performance measured?
 - Is master production software utilized and does it include exception reporting to direct the master scheduler to items requiring attention?
 - Are master schedule changes made within the planning time zones managed; are changes authorized by the appropriate people, measured and reviewed for cause? Are changes made only when it has been demonstrated that production capacity and materials are or can be made available?
 - Are no items on the master schedule past due? Do the master scheduler, and other affected company personnel recognize an item cannot be manufactured, purchased, or shipped in past time periods?
 - Is there a defined process to determine what levels in the product structure are to be master scheduled?

- ***Detail Questions Supporting MPSPC 1*** - Is rough-cut capacity planning, or its equivalent, used to evaluate the impact of significant master schedule changes on critical resources?
- ***Is accountability for master schedule performance established and have the goals and method of measurement been agreed upon?***
- ***Are appropriate analyses highlighting the primary causes of all deviations outside established and management tolerances conducted?***
- ***Have goals for master schedule performance been defined?***
- ***MPSPC 2*** - There are no symptoms of master production system mismanagement.
 - ***Detail Questions Supporting MPSPC2*** - Are capacity plans overloaded or extremely front loaded?
 - ***Are lead times excessively short and is expediting frequently needed?***
 - ***Are there an excessive number of past due shop orders and purchase orders?***
 - ***Does the supplier have poor on time delivery performance?***
 - ***Does the supplier have an excessive amount of work-in-process?***
- **Master Production Scheduling Metrics**
 - **MPS Performance**
 - **MPS Accuracy**

- ***Rough Cut Capacity Planning Performance Criteria*** - There is a capacity planning process using rough-cut capacity planning in which planned capacity, based on demonstrated output, is balanced with required capacity.
 - ***Detail Questions Supporting Rough Cut Capacity Planning Performance Criteria*** - Is capacity planning well understood by all appropriate personnel and used to plan labor and equipment requirements?
 - Is there an understanding of the respective responsibilities of the capacity planner (scheduling) and production (manufacturing) in the capacity management process? Is accountability for maintaining the accuracy of schedules and production oriented planning data, such as planned capacity, number of workers, number of machines, and number of shifts, assigned, understood, and accepted?
 - Are all activities that consume capacity considered in identifying capacity requirements (e.g. maintenance, engineering projects, breakdowns, etc.)?
 - When necessary, are other constraints such as engineering and suppliers capacity considered in the capacity management process?
 - Is a load factor that recognizes capacity loss due to efficiency, utilization, absenteeism, meetings, and anything else that is not included in the proper application of standard times maintained and used in projecting capacity?
 - Is demonstrated capacity measured and used to update planned capacity (demonstrated capacity plus or minus any planned capacity changes)?
- ***Rough Cut Capacity Planning Metrics***
 - Demonstrated Capacity (Critical Resources)
 - Planned versus Actual Overtime (Critical Resources)



PPC System (Tactical): Material Requirements Planning

Assessment Criteria and Metrics

DEFENSE CONTRACT MANAGEMENT AGENCY

- ***Material Requirements Planning Performance Criteria*** - There is a material planning process that maintains valid material plans along with a control process that communicates priorities through production schedules, supplier schedules, and/or kanban mechanisms.
 - ***Detail Questions Supporting Material Requirements Planning Performance Criteria*** - Do material planners and schedulers understand the product, manufacturing process, and purchasing process, as well as a manufacturing planning and control system?
 - Is accountability for creating and maintaining a valid plan for material assigned, understood, and accepted?
 - Are material planners responsible for creating, maintaining, reviewing, and analyzing the validity of all appropriate planning parameters such as order quantities, lot sizes, lead times, scrap factors, shrinkage, safety stocks, etc?
 - Do production and purchasing understand and use the planning and control system? Is accountability for maintaining valid data under their responsibility assigned, understood, and accepted?
 - Are material plan audits conducted monthly, and the audits reflect plan validity to be in the 95-100% range?
 - Are there formal communication processes among material planning, production, and purchasing for the purpose of exchanging information needed to maintain valid material plans and schedules?
 - Have informal priority systems (shortage list, hot list, etc.) been eliminated, and is there only one formalized priority-setting mechanism?
 - Are material plans expressed in weekly or smaller time periods to provide appropriate resolution of priorities?
 - Does the material planning system run as frequently as required to maintain valid schedules. (daily may be required, but weekly processing is a minimum)?



PPC System (Tactical): Material Requirements Planning

Assessment Criteria and Metrics (Continued)

- ***Detail Questions Supporting Material Requirements Planning Performance Criteria - Does the system use industry accepted standard logic to generate exception-driven action messages, including Need to Release Order, Need to Cancel Order, Past Due, or Release Past Due?***
- ***Does the system have an effective component availability checking mechanism that material planners use to determine the feasibility of releasing production orders or schedules?***
- ***Are all exception-driven action messages prioritized, reviewed, and resolved in a timely manner?***
- ***Are the number of exception-driven action messages for each material planner monitored for activity, trends, and volume? Is this data used to ensure the necessary work is getting done and enough planner capacity exists to handle all the action messages?***
- ***Where work orders are used, is the volume of reschedules tracked to monitor the stability of the plan and to determine the causes of excessive rescheduling activity?***
- ***Where work orders are used, are orders released with full material availability and full lead time 95-100% of the time?***
- ***Material Requirements Planning Metrics***
 - **Basic Master File Data Accuracy**
 - **Inventory Record Accuracy**
 - **BOM Accuracy**
 - **Material Plan Accuracy**
 - **Percentage of Orders Rescheduled after Release**
 - **Percentage of Orders Released with less than planned Lead Time**
 - **Unplanned Activities (material substitutions, product design deviations, etc.)**
 - **Exception Report Volume**

- ***Capacity Requirements Planning Performance Criteria*** - There is a capacity planning process using capacity requirements planning which plans capacity, based on demonstrated output, is balanced with required capacity. A capacity control process is used to measure and manage manufacturing requirements, work throughput, and queue levels.
 - ***Detail Questions Supporting Capacity Requirements Planning Performance Criteria*** - Is capacity planning well understood by all appropriate personnel and used to plan labor and equipment requirements?
 - Is there an understanding of the respective responsibilities of the capacity planner (scheduling) and production (manufacturing) in the capacity management process?
 - Is accountability for maintaining the accuracy of schedules and production oriented planning data, such as planned capacity, number of workers, number of machines, and number of shifts, is assigned, understood, and accepted?
 - Do production and capacity planners meet at least weekly to resolve capacity issues?
 - Are all activities that consume capacity considered in identifying capacity requirements (e.g. maintenance, engineering projects, specials, etc.)?
 - When necessary, are other constraints such as engineering and suppliers capacity are considered in the capacity management process?
 - Are work areas appropriately defined to enable control of priorities and capacities while minimizing data maintenance, transactions, and reports?

PPC System (Tactical): Capacity Requirements Planning

Assessment Criteria and Metrics(Continued)

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- ***Detail Questions Supporting Capacity Requirements Planning Performance Criteria*** - Is a load factor that recognizes capacity loss due to efficiency, utilization, absenteeism, meetings, and anything else that is not included in the proper application of standard times is maintained and used in projecting capacity?
- Is corrective action taken to reschedule overdue capacity requirements caused by past due orders?
- Does the capacity planning process include appropriate analysis of the elements that make up demonstrated capacity such as efficiency, utilization, absenteeism, etc?
- Where applicable, is capacity requirements planning is used to evaluate detailed capacity constraints when planning and identifying labor and equipment needs?
- Are capacity detail and summary screens or reports by work area available in a graphic or matrix format and used by capacity planners to identify capacity and scheduling problems?
- Is a process in place that includes variance analysis of work area planned and actual input, output, and queue levels?
- **Capacity Requirements Planning Metrics**
 - Demonstrated Capacity (Work-Center)
 - Planned versus Actual Overtime (Work-Center)



- ***Shop Floor Control Performance Criteria*** - There is a planning process supported by a control process that creates, maintains, and synchronizes detailed production schedules. These synchronized schedules communicate valid manufacturing priorities through various methods to the shop floor.
 - ***Detail Questions Supporting Shop Floor Control Performance Criteria*** - Is production accountable for meeting scheduled operation due dates, daily run rates, kanban replenishments, etc. in a timely manner?
 - Does production understand the product, manufacturing process, and priority scheduling mechanisms being used?
 - Are process instructions readily available for the various operations needed to build the product?
 - Does a formal job description exist, that details the responsibilities and performance measurements for the production function?
 - Does production work to a formal schedule that is communicated through various methods?
 - Have informal priority systems (e.g. hot list) been eliminated? Are emergency phone calls, expediting meetings, hot stickers, etc. not honored in production?
 - Is the production floor orderly, clean, and lacks clutter?
 - Does production flow in a uniform manner as defined in production policies and procedures?
 - Have production personnel been trained in using the output from the planning and control system?
 - Is production responsible for feeding back all potential production problems to the master scheduler if these problems affect the company's ability to meet the master schedule?

- ***Detail Questions Supporting Shop Floor Control Performance Criteria (Continued) - Does the planning and control process include a capability to display production schedules on a daily basis? Are these schedules shown on computer screens, reports, boards, graphs, etc?***
- ***Are production schedules expressed in weekly, daily, or smaller time periods? These schedules may be work order-or rate based and should be re-planned daily (maximum weekly).***
- ***Are constrained resources identified and managed to ensure maximum throughput?***
- ***Are fixed constrained resources identified and is there a strategy in place to eliminate as many constrained resources as practical.***
- ***Shop Floor Control Metrics***
 - **Build Plan Adherence**
 - **Order Release Performance**
 - **Constrained Resource Utilization**
 - **Work Instruction Availability**
 - **Out of Station Hours (Normalized)**

- ***Work Measurement System Performance Criteria 1*** - There is a work measurement system that ensures the accurate measurement of work, the establishment of performance goals, and the identification and correction of problems preventing the attainment of these goals. There is a work measurement plan and supporting procedures with clear definition of the organization and personnel responsible for the execution of the system.
 - ***Detail Questions Supporting Shop Floor Control Performance Criteria 1*** - Is there a work measurement plan and supporting procedures?
 - Is there an explicit definition of standard time that is applicable throughout the entire work measurement system?
 - Is there a clear definition of the organization and personnel responsible for the execution of the system?
 - Does the system require the use of recognized industrial engineering techniques to establish standards?
 - Does the system take full advantage of available standard time data?
 - Are work measurement personnel involved with time study, predetermined time study, or standard data application be soundly trained in the use of any tool or techniques they use to determine standard times and participate in periodic refresher sessions to maintain a high level of proficiency?
 - Are labor standards reviewed for accuracy and appropriate system data revisions made when changes occur to: methods or procedures; tools, jigs, and fixtures; work place and work. layout: specified material; and work content of the job?

- ***Detail Questions Supporting Shop Floor Control Performance Criteria 1 (Continued)*** - Are all time studies rated using recognized leveling/performance rating techniques?
- Are allowances for personal, fatigue, and unavoidable delays developed and included as part of the labor standard? Are allowances reasonable and consistent with those normally allowed for like work and conditions?
- Are work units clearly and discretely defined so as to cause accurate measurement of the work completed and expressed in terms of completed: end items; operations; or lots or batches of end items?
- ***Work Measurement System Performance Criteria 2*** - The work measurement system drives the establishment of and management review of performance objectives, for the analysis of the elements of performance realization factors and the subsequent action to improve labor performance. The system also provides for the integration and use of applicable elements of work measurement with other management systems such as budgeting, estimating, planning and scheduling.
 - ***Detail Questions Supporting Shop Floor Control Performance Criteria 2*** - Are there procedures for the use of labor standards as an input to budgeting, estimating, production planning. and touch labor performance evaluation?
 - Do procedures clearly distinguish when/how historic “actual hour data” should be utilized in lieu of standards?
 - Are updated standards made available to all users (e.g. budgeting, estimating, planning) in a timely manner?

Work Measurement System

Assessment Criteria and Metrics (Continued)

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- ***Detail Questions Supporting Shop Floor Control Performance Criteria 2*** - Are there procedures for the use of labor standards as an input to budgeting, estimating, production planning, and touch labor performance evaluation?
- Do procedures clearly distinguish when/how historic “actual hour data” should be utilized in lieu of standards?
- Are updated standards made available to all users (e.g. budgeting, estimating, planning) in a timely manner?
- Does the work measurement system provide for periodic reporting of labor performance. Is the report prepared at least weekly for each work center and summarized at each appropriate management level. Does the report identify indicate labor efficiency and compare current results with goals?
- Are labor performance reports reviewed by supervision and staff support functions? When significant departures from projected performance goals occur, is analysis conducted to address causes and is corrective action initiated when necessary?
- ***Work Measurement Metrics***
 - Labor Standards Accuracy
 - Timeliness, Labor Standards Updating
 - Point of Use Accuracy

- ***Continuous Improvement System Performance Criteria 1*** - Top executives are actively involved in establishing and communicating the organization's strategy and related goals for the business. The strategy and goals are deployed to ensure that all employees are aware of the organization's vision, plans, goals, and values.
 - ***Detail Questions Continuous Improvement Performance Criteria 1*** - Have key performance indicators been established and are they reviewed monthly by top management to ensure continuous improvement?
 - Does top management not only understand continuous improvement concepts, but also uses these tools and techniques as part of the management process?
 - Are resources such as time and money provided throughout the organization for innovation and continuous improvement?
 - Can employees articulate the company's strategic goals and focus their improvement activities to support them?
 - Are all employees encouraged to contribute to improvements in processes and systems?
 - Does management monitor the extent to which continuous improvement tools and techniques are being utilized and routinely remove barriers to performance and innovation?

Continuous Improvement System Assessment Criteria and Metrics (Continued)

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- ***Continuous Improvement System Performance Criteria 2*** - There is demonstrated discontent with the status quo, manifested by a company-wide commitment to the continuous and relentless reduction and elimination of waste. Waste is understood to be an activity that does not add value to the product for the customer.
 - ***Detail Questions Supporting Continuous Improvement Performance Criteria 2*** - Is a formal program used to expose, prioritize and stimulate the reduction or elimination of non-value added activities?
 - Is a formal, visible and continuous process in place to reduce changeover times, inspection, lead times, lot sizes, redundancy, safety stocks, queues, and all other types of non-value added activities? Can employees at all levels and in all areas articulate the essence of this process and are contributing ideas for, and are participating in, waste elimination initiatives? Have goals have been set? Are results documented and publicized?
 - Does a formal and active program exist to reduce scrap, rework, and shrinkage, and to increase yields? Have goals have been set? Are results documented and publicized?
 - Has a total productive maintenance process been implemented? Have goals been set? Are results documented and publicized?
 - Are all improvement successes integrated into the business functions of budgeting, estimating and planning in a timely manner?



- ***Continuous Improvement System Performance Criteria 3*** - Routine use of continuous improvement tools has become a routine way of doing business throughout the company.
 - ***Detail Questions Supporting Continuous Improvement Performance Criteria 3*** - Are all members of the company make decisions based on data?
 - **Are cause and effect diagrams routinely used throughout the manufacturing?**
 - **Are key problems under attack shown in visible displays containing information about the team members, root cause and variation analysis, actions, and results?**
 - **Are control charts used where appropriate, but are not the only continuous improvement tools in evidence?**
 - **Are flow charts used to document key processes in manufacturing?**
 - **Have standardized processes been implemented to eliminate process variation?**
 - **Are multiple levels of Pareto charts used to identify the root cause where appropriate?**
 - **Is inspection viewed as waste? Has inspection been reduced or eliminated as process control is being achieved?**

Continuous Improvement System Assessment Criteria and Metrics (Continued)

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- ***Continuous Improvement System Performance Criteria 4 - Resources and facilities required to meet the needs of customers profitability are continuously being made more flexible, and cost effective.***
 - ***Detail Questions Supporting Continuous Improvement Performance Criteria 4 - Are plants and office layouts being continuously improved to simplify and reduce physical transport of material or sharing of information?***
 - ***Is equipment selected based on its contribution to improved quality, fast changeover, minimum lot sizes, flexibility, and overall throughput time? Does a policy exist to justify equipment based on these factors in addition to traditional selection criteria?***
 - ***Do authorizations for capital spending place high value on the company's drive to improve quality and increase the velocity of product from suppliers through the plant and out to the customer?***
 - ***Are simplified manufacturing processes with visual controls in place (allowing problems to be identified quickly)?***
 - ***Are tools and fixtures stored primarily at the point of use, where practical?***
 - ***Are setup and changeover times being systematically and continuously reduced?***
 - ***Is unplanned machine downtime documented and being reduced?***
 - ***Is good housekeeping being pursued as a high priority item by all personnel?***

- ***Continuous Improvement System Performance Criteria 5 - The velocity and linearity of workflow is continuously measured, reported, and improved.***
 - ***Detail Questions Supporting Continuous Improvement Performance Criteria 5 - Is there a stated company objective to emphasize improvement in velocity and eliminate waste in all processes?***
 - ***Are process improvements being made such that routings are being simplified, and bills of materials are being flattened, or phantom codes are being used to improve velocity?***
 - ***Are production lines being redesigned to enable mixed model scheduling with a minimum of material handling?***
 - ***Are functional plant layouts being replaced with cellular manufacturing where appropriate?***
 - ***Are lead times in all areas measured and reported, and being reduced?***
- ***Continuous Improvement System Performance Criteria 6 - Jobs are designed to reinforce the company goal of a team based, empowered workforce.***
 - ***Detail Questions Supporting Continuous Improvement Performance Criteria 6 - Is work is standardized to ensure consistency of all processes?***
 - ***Is skill training formalized and managed to create the desired level of flexibility?***
 - ***Is a performance management system in place to provide ongoing feedback to teams and individuals?***

- ***Continuous Improvement System Performance Criteria 7 - Company performance measures emphasize quality, delivery, and cost.***
 - ***Detail Questions Supporting Continuous Improvement Performance Criteria 7 - Are performance measures communicated to all through visible displays that show progress and point the way to improvement?***
 - ***Is valid and timely information collected and analyzed on all products and services for external customers and significant and targeted internal customers and suppliers?***
 - ***Does a data and information collection process exist measuring all aspects of the organization's processes, customers, and suppliers? Do the data collectors and generators understand the purpose of the data?***
 - ***Is information collected timely, useful, accurate, and complete? Does benchmark data exist for comparative purposes?***
 - ***Are routine, periodic checks made to ensure the validity of data and information collected?***
 - ***Have objectives been established for production and supplier defects? Is performance measured, and are goals being achieved?***
 - ***Is cost of quality reporting being executed? Have objectives been set for cost of quality? Is performance being measured, and are goals being achieved?***
 - ***Do delivery measures include linearity of output and on-time deliveries?***
 - ***Do key measures include inventory days on hand (or turns)?***
 - ***Are cost of quality reports presented as a routine part of management reporting (this includes appraisal, failure and prevention)?***



- ***Continuous Improvement System Performance Criteria 8*** - Short and long term breakthrough goals that cause the organization to re-engineer or replace current processes are established, regularly reviewed and monitored. These breakthrough goals are targeted on improvements in total cost, cycle time, and customer requirements.
 - ***Detail Questions Supporting Continuous Improvement Performance Criteria 8*** - Do operational improvements for achieving improved response time, and reduced total cost goals carry clear priorities and accountability?
 - Does a formal process for establishing goals and plans exists and is followed?
 - Are both intuitive and quantitative information used to identify areas of improvement? Is benchmarking, customer requirements, process capability, and supplier requirements regularly employed in this process?
 - Do all levels of the organization participate in the improvement planning process?
 - Are key requirements in technology, training, and education, and supplier requirements regularly assessed and factored into the plans? Are future targets and current status part of the factoring and prioritization process?
- ***Continuous Improvement Metrics***
 - Number of Projects Scheduled
 - Number of Projects In-Work
 - Number of Projects Completed (YTD)
 - Planned versus Actual ROI (By Project)
 - Key Supplier Metrics (e.g. delivery performance, cost performance, cost of quality, inventory turns, etc.) should be monitored for trends, providing insight into continuous improvement effectiveness

- ***Producibility System Performance Criteria 1*** - The organization encourages the involvement of all components of the enterprise during the entire cycle of conceptualization, development, design, manufacturing, and support of a product. Integrated Product Teams (IPT) are formed and have the responsibility and authority for the new product. Team membership includes suppliers, vendors, and the customer.
 - ***Detail Questions Supporting Continuous Improvement Performance Criteria 1*** - Does the organization recognize the need for management Commitment and make producibility integral to the business? Are people trained, empowered, and encouraged to team?
 - Is the organization organized for producibility, by forming multi-disciplinary Integrated Product Teams to facilitate communication?
 - Has a risk management program been implemented? Does the program identify, assess, and attempt to mitigate production risk early in the design process?
 - Does the organization incorporate Producibility into new product introduction strategy and include producibility in every phase of the product development process?
 - Does the organization apply best practices knowledge by maintaining and using design guidelines based on past experience?
 - Has the organization instilled a commercial best practices philosophy, identifying and adopting commercial industry best practices? Whenever possible, does the organization use known solutions and processes?

- ***Producibility System Performance Criteria 2*** - Process capability is understood, measured, controlled, and documented, both in general and on a per product basis, and process capability information is updated at periodic intervals. Information must be focused on what can be successfully manufactured accurately and repeatedly under various conditions and not what can be manufactured once under the best possible circumstances.
 - ***Detail Questions Supporting Continuous Improvement Performance Criteria 2*** - Does the organization understand current process capabilities (both its own and for their suppliers)?
 - Does the organization measure and control processes for thorough understanding?
 - Is process knowledge documented in process capability guidelines and update routinely?.
 - Are future process capabilities predicted?
 - Are new technologies studied for integration?
 - Does the organization ensure that processes are sufficiently mature to use in production?

- ***Producibility System Performance Criteria 3*** - Producibility is addressed during every aspect of design and development in order to achieve the desired outcome of affordable products that meet the needs of the customer. During conceptual design, the IPT responsible for the product includes a representative of manufacturing. The IPT ensures that manufacturing issues are considered in every stage of the process. The IPT ensures that the maturity of manufacturing processes is considered during the assessment of various design options. When a design and associated processes are selected for which a particular process is technologically immature, the IPT understands the implications of that choice and the investment needed to mature the process before production.
 - ***Detail Questions Supporting Continuous Improvement Performance Criteria 3*** - Are product goals identified? Are the goals appropriate, realistic and based on customer needs?
 - Are key characteristics (with the greatest impact on meeting product goals) identified?
 - Are trade studies on alternative product and process design performed? This includes the assessment of alternative design concepts against product goals including producibility considerations.
 - Is a manufacturing plan developed? Does the plan identify manufacturing processes including factory requirements? Does plan highlight process development and long-lead capital equipment needs?
 - Is complexity analysis performed? Are product design and manufacturing processes simplified to reduce manufacturing and assembly difficulties and prevent cost and schedule problems?

- ***Producibility System Performance Criteria 4*** - During detailed design, the IPT responsible for the product continues to include a representative of manufacturing. As the product transitions to a final detailed design, the IPT ensures that every aspect of producibility has been addressed. As part of detailed design, product and process data are definitized through prototyping and testing of hardware and processes. It is during detailed design that the manufacturing plan, is fully developed.
 - ***Detail Questions Supporting Continuous Improvement Performance Criteria 4*** - Are producibility engineering reviews conducted? Do the reviews determine if designs can be produced with available manufacturing capabilities?
 - Is error-proof design common practice? Is the design simplified to minimize production errors?
 - Is manufacturing optimized? Are prototypes and simulations used to evaluate the design and the manufacturing floor capabilities? Are final design trade-offs conducted?.

- ***Producibility System Performance Criteria 5*** - The organization effectively measures producibility. Measurements are used as a tool for evaluating the effectiveness of producibility performance and for determining the degree to which improvements need to be made to ensure that future products are producible. Management is committed to measuring all aspects of the organization, its products, and processes to continuously assess progress towards the enhancement of producibility. The organization bases its business judgments on fact and not on opinion and measurement is the process by which facts are gathered.
 - ***Detail Questions Supporting Continuous Improvement Performance Criteria 5*** - Are processes measured? Is data obtained for understanding process capabilities?
 - Are processes controlled to reduce process variation?
 - Are products measured to verify that they meet customer quality, schedule, and cost requirements?
 - Is the producibility system measured? Is the success of producibility efforts assessed by evaluating producibility on a per-product basis?
 - Are producibility benchmark against world-class companies established and does the organization strive for continuous improvement?

- ***Producibility Metrics***
- **IPT turnover rate**
- **Manufacturing staffing rate (mfg eng headcount/design engineer headcount)**
- **Actual staffing versus planned**
- **Milestone completion versus plan**
- **Percent of parts modeled as solids**
- **Performance to development schedule**
- **Progress toward life-cycle cost objectives**
- **Number of drawings released versus number of drawings scheduled for release.**
- **Percent of errors, BOM versus Drawing**
- **% of errors in BOM versus work instructions.**
- **Current cost estimates/budgets versus original cost estimates/budgets as design matures.**
- **Number of post design changes**
- **Number of in process design changes**
- **Number of design review deficiencies**
- **Drawing growth (unplanned drawings/total planned drawings)**
- **Number of drawings released versus number of drawings scheduled for release.**